

SPECIFICATION AMENDMENTS

Please amend current paragraph [0003] as follows:

[0003] The term “spintronics” refers to a new generation of electronic devices that make use of the electron spin as well as its charge. It is anticipated that spintronic devices will have superior properties compared to their semiconductor counterparts based on reduced power consumption due to their inherent nonvolatility, elimination of the initial booting-up of random access memory, rapid switching speed, ease of fabrication, and large number of carriers and good thermal conductivity of metals. Such devices include giant magnetoresistance (GMR) and tunneling magnetoresistance (TMR) structures that consist of ferromagnetic films separated by metallic or insulating layers, respectively. Switching of the magnetization direction of such elementary units is by means of an external magnetic field that is generated by current pulses in electrical leads that are in proximity.

Please amend current paragraph [0004] as follows:

[0004] As used herein, the term “resonance” shall mean the process by which the wave amplitude and probability are transferred between two degenerate states[[,]] in a manner analogous to the energy transfer between two harmonic oscillators. As used herein, the term “resonance absorption” shall mean the absorption of radiation by an atom (or molecule) at a frequency corresponding to some transition between stationary states. As used herein, the term “resonance frequency” shall mean the frequency at which resonance absorption occurs; the difference between some pair of atomic energy levels divided by Planck’s constant.

Please amend current paragraph [0009] as follows:

[0009] Figure 1a is an illustration ~~photograph~~ of a 5 μ m coating of the organic V[TCNE]₂ magnet on a glass cover slide being attracted to a Co₅Sm magnet at room temperature in the air.

Please insert the following paragraph between current [0009] and [0010]:

Figure 1b is an illustration of one embodiment of a spin driven resistor produced in accordance with present invention.

Please amend current paragraph [0018] as follows:

[0018] In developing the spin driven resistor (SDR) of the present invention, a magnetic body was placed in electrical communication with two conducting wires. The wires were each connected to a voltage source so as to place a potential across the magnetic body. The resistance of the magnetic body was then measured, for example with a voltmeter. The magnetic body's resistance was monitored with the voltmeter as the SDR was subjected to an externally applied dc magnetic field. Additionally, a time varying electromagnetic field acted upon the SDR. As the dc magnetic field is increased or decreased so as to pass the value of 'resonance' to occur so that electromagnetic energy is absorbed, there is a change in the resistance of the sample (increase or decrease), termed the spin driven resistance due to activation of the spin driven nanogate.

Please amend current paragraph [0019] as follows:

[0019] Metallic or semi-conducting ~~semiconducting~~ magnets with a substantial excess of one polarization of conduction carrier spin polarization over the opposite of spin polarization are preferred.

Please amend current paragraph [0020] as follows:

[0020] A spin driven resistor of the present invention was developed using the ~~“half semiconductor”~~ “half semi-conductor” $V[TCNE]_x$. Figure 1a is an illustration photograph of a $5\mu m$ coating of the organic $V[TCNE]_2$ magnet on a glass cover slide **12** being attracted to a Co_5Sm magnet **10** at room temperature in air. Figure 1b is an illustration of a spin driven resistor **13** produced in accordance with the present invention. As is shown, spin driven resistor **13** comprises a magnetic body **14** in electrical communication with voltage source **16** via electrical connections (which may be wires) **18**. Figure 2 shows the magnetization (emu/mol) as a function of temperature for the organic $V[TCNE]_2$ magnet shown in Figure 1a. As can be seen from Figure 2, the organic $V[TCNE]_2$ magnet shows ordering at 370K. The chemical structure of tetracyanoethanide is shown in Figure 3. The newly achieved SDR is a spin-dependent quantum effect active at room temperature.

Please amend current paragraph [0022] as follows:

[0022] Figure 5 shows the 290 K electron paramagnetic resonance derivative signal (a) measured for $V[TCNE]_x$ films (prepared via low-temperature (40° C) chemical vapor deposition) that are magnetic at room temperature. Also shown in Figure 5 is the

absorption curve (b) that represents the power absorbed by the sample. As expected, it was found that the EPR (~~WHAT DOES EPR STAND FOR?~~) line shape and center field depend upon the angle of the $V[TCNE]_x$ films with respect to the applied magnetic field.

Please amend current paragraph [0024] as follows:

[0024] Figure 8 presents the $\Delta R/R$ as a function of temperature from 275 K to 298 K for a $V[TCNE]_x$ film subjected to 20.2 mW of microwave radiation. The $\Delta R/R$ decreases three-fold as the temperature is increased across this temperature range.

Please amend current paragraph [0025] as follows:

[0025] A proposed mechanism for spin driven resistor operation may be understood by viewing Figure 4. The $V[TCNE]_x$ is proposed to be a half semiconductor with a filled lower Hubbard energy band centered on the $TCNE^-$ sites (one electron per site). The magnetic exchange coupling of the spin $S = 1/2$ of $TCNE^-$ sites with the $S = 3/2$ of V^{2+} sites result in all of the sites in this lower Hubbard band being in the same spin direction. With $x < 2$, typical of samples made, the upper Hubbard band is assumed partly occupied with electrons with spin opposite to that of the electrons in the lower Hubbard band due to the Pauli exclusion principle. The conductivity is by hopping among states in the upper Hubbard band.

Please amend current paragraph [0028] as follows:

[0028] It is noted that SDR may have eventual application in a variety of spintronic devices, including read heads and detectors that are very fast and operate at

low power. The SDR phenomenon may also be used to modulate spin valve, spin tunnel junction, spin-LED, and spin-transistor devices by exposing the magnetic semiconductor or conductor layer to a time varying electromagnetic field and a dc magnetic field so as to pass through a resonance condition.

Please amend the Abstract as follows:

A spin driven resistor ~~comprising~~ including a magnetic body whose resistance increases due to resonance when subjected to an externally applied magnetic field while in the presence of an externally applied electromagnetic field is presented. The spin driven resistor has applications in a variety of spintronic devices including read heads and detectors that are very fast and operate and low power. The spin driven resistor may also be used to modulate spin value, spin tunnel junction, spin-LED, and spin-transistor devices by exposing the device to an electromagnetic field and a magnetic field.